

AMENDMENTS TO THE CLAIMS

Claim 1 (currently amended): A level adjustment method executed in applicable to an audio processing apparatus having a plurality of amplifiers corresponding to three or more of channels of audio signals, ~~which constitute a set of surround signals in a surround system,~~ for inputting the audio signals and amplifying the input audio signals, the level adjustment method comprising:

 a group type select process of selecting a grouping type among a plurality of grouping types, according to operation by a user;

 a group arrangement process of arranging the plurality of the channels into one or more groups according to the selected grouping type, such that the groupings of the channels are different as between any given two of the grouping types and that, at all times, each of the channels of audio signals belongs to only one of the groups;

 a detection process of detecting, for each group, a maximal value of the signal levels of the input audio signals of channels belonging to the group; and

 an adjustment process of determining, for each group, a common amplification gain according to the detected maximum value and supplying the determined common amplification gain to the amplifiers of the channels belonging to the group such as to attenuate the output levels of the input audio signals if the maximum value exceeds a threshold level specified by the user,

wherein said three or more channels of audio signals constitute a set of surround signals in an ordinary surround system and are grouped together into one or more groups during said group arrangement process, and

wherein, when the maximum signal level is below the threshold level, the adjustment process is performed to maintain the common amplification gain, when the maximum signal level

exceeds the threshold level, the adjustment process is performed to attenuate the level of the input audio signals.

Claim 2 (canceled)

Claim 3 (previously presented): The level adjustment method according to claim 1, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel, and an LFE channel, and wherein the group arrangement process arranges all of the left channel, the right channel, the left surround channel, the right surround channel, the center channel and the LFE channel into one group, according to the selected grouping type.

Claim 4 (previously presented): The level adjustment method according to claim 1, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel, and an LFE channel, and wherein the group arrangement process arranges the channels into a first group including the left channel, the right channel, the left surround channel, the right surround channel and the center channel, and a second group including the LFE channel, according to the selected grouping type.

Claim 5 (previously presented): The level adjustment method according to claim 1, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel, and an LFE channel, and wherein the group arrangement process arranges the channels into a first group including the left channel, the right channel and the center channel, a second group including the left surround channel and the right surround channel, and a third group including the LFE channel, according to the selected grouping type.

Claim 6 (previously presented): The level adjustment method according to claim 1, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel, and an LFE channel, and wherein the group arrangement process arranges the channels into a first group including the left channel and the right channel, a second group including the left surround channel and the right surround channel, a third group including the LFE channel, and a fourth group including the center channel, according to the selected grouping type.

Claim 7 (previously presented): The level adjustment method according to claim 1, further comprising a band separation process of separating the respective channels into a plurality of frequency bands, so that the group arrangement process, the detection process and the adjustment process are applied to a respective one of the frequency bands.

Claim 8 (canceled)

Claim 9 (previously presented): The level adjustment method according to claim 1 wherein the detection process further comprises a sample and hold process of successively sampling absolute values of the signal level of each channel for a predetermined period and holding a greatest one of the sampled absolute values, so that the sampled and held greatest absolute value represents the signal level of the channel.

Claim 10 (previously presented): The level adjustment method according to claim 9, wherein the detection process detects a maximal one of the respective greatest absolute values sampled and held for the respective channels of the same group, thereby determining the maximal signal level.

Claim 11 (currently amended): A level adjustment method ~~applicable to~~executed in an audio processing apparatus having a plurality of amplifiers corresponding to three or more of channels of audio signals, ~~which constitute a set of surround signals in a surround system,~~ for inputting the audio signals and amplifying the input audio signals, the level adjustment method comprising:

a group type select process of selecting a grouping type among a plurality of grouping types, according to operation by a user;

a group arrangement process of arranging the plurality of the channels into one or more groups according to the selected group type, such that the groupings of the channels are different as between any given two of the grouping types and that, at all times, each of the channels of audio signals belongs to only one of the groups;

a detection process of detecting, for each group, a maximal value of the signal levels of the input audio signals of the channels belonging to the group; and

an adjustment process of determining, for each group, a common amplification gain according to the detected maximum value and supplying the determined common amplification gain to the amplifiers of the channels belonging to the group so as to attenuate the level of the output audio signals if the maximum value exceeds a threshold levels specified by the user,

wherein said three or more channels of audio signals constitute a set of surround signals in an ordinary surround system and are grouped together into one or more groups during said group arrangement process,

wherein, when the maximum signal level is below the threshold level, the adjustment process is performed to maintain the common amplification gain, when the maximum signal level

exceeds the threshold level, the adjustment process is performed to attenuate the level of the input audio signals, and

wherein the common amplification gain is determined such that the excess of the maximum value is suppressed in accordance with a ratio specified by the user.

Claim 12 (canceled)

Claim 13 (currently amended): The level adjustment method according to ~~claim 12~~claim 11, wherein the adjustment process smoothens a transition of the amplification gain around the threshold level according to a predetermined knee parameter.

Claim 14 (previously presented): The level adjustment method according to claim 11, further comprising a response control process of controlling a response of the adjusting of the amplification gain relative to the detecting of the maximal signal level according to predetermined attack and release parameters.

Claim 15 (currently amended): An audio processing apparatus comprising:

a plurality of amplifiers corresponding to three or more of channels of audio signals, which constitute a set of surround signals in a surround system, for amplifying signal levels of the respective channels;

a group type select section that, in response to user operation, selects a desired grouping type among a plurality of grouping types;

a group arrangement section for arranging the plurality of the channels into one or more group according to the selected grouping type, such that the groupings of the channels are different as between any given two of the grouping types and that, at all times, each of the channels of audio signals belongs to only one of the groups;

a detection section that detects, for each group, a maximal value of the signal levels of the input audio signals of the channels belonging to the group; and

an adjustment section that determines, for each group, a common amplification gain according to the detected maximum value and supplying the determined common amplification gain to the amplifiers of the channels belonging to the group so as to attenuate the output levels of the input audio signals if the maximum value exceeds a threshold level specified by the user,

wherein said three or more channels of audio signals constitute a set of surround signals in an ordinary surround system and are grouped together into one or more groups during said group arrangement process, and

wherein, when the maximum signal level is below the threshold level, the adjustment process is performed to maintain the common amplification gain, when the maximum signal level

exceeds the threshold level, the adjustment process is performed to attenuate the level of the input audio signals.

Claim 16 (canceled)

Claim 17 (currently amended): A graphic user interface installed in an audio processing apparatus having a plurality of amplifiers corresponding to three or more of channels of input audio signals, ~~which constitute a set of surround signals in a surround system,~~ for amplifying the input audio signals, the graphic user interface being designed for assisting the audio processing apparatus in performing a level adjustment method comprising a group arrangement process of arranging the plurality of the channels into one or more group, and a group control process of controlling each group such as to attenuate the output levels of the input audio signals belonging to the same group as a maximal value of the signal levels of the input audio signals belonging to the group increases, wherein the graphic user interface provides:

a visual symbol prompting the user to select a desired grouping type among a plurality of grouping types, the grouping of the channels at the group arrangement process is controlled according to the selected grouping type, such that the groupings of the channels are different as between any given two of the grouping types; and

another visual symbol prompting the user to input parameters, including a threshold level, effective to determine how the output audio signals is attenuated according to the maximal signal level during the group control process,

wherein said three or more channels of audio signals constitute a set of surround signals in an ordinary surround system,

wherein, at all times, the group arranged by the group arrangement process are different between any two of the grouping types and each of the channels of audio signals belong to only of the groups, and

wherein, when the maximum signal level is below the threshold level, the group control process is performed to maintain the common amplification gain, when the maximum signal level exceeds the threshold level, the adjustment process is performed to attenuate the level of the input audio signals.

Claim 18 (currently amended): The graphic user interface according to claim 17, wherein the parameters further include a threshold parameter and a knee parameter, such that the group control process attenuate the output levels of the input audio signals when the maximal signal level exceeds a threshold level determined by the threshold parameter, and smoothens a transition of the amplification gain around the threshold level according to the knee parameter.

Claim 19 (currently amended): An audio processing apparatus comprising:
a plurality of amplifiers corresponding to three or more of channels of input audio signals;
~~which constitute a set of surround signals in a surround system~~, for amplifying the input audio signals;

a group type select section of selecting a grouping type among a plurality of grouping types, according to operation by a user

a group arrangement section that arranges the plurality of the channels into two or more groups according to the selected grouping type, such that the groupings of the channels are different as between any given two of the grouping types and that, at all times, each of the channels of audio signals belongs to only one of the groups;

a detection section that detects, for each group, a maximal value of the signal levels of the input audio signals of the channels belonging to the same group; and

an adjustment section that determines, for each group, a common amplification gain according to the detected maximum value and supplying the determined common amplification gain to the amplifiers of the channels belonging to the group so as to attenuate the level of the output audio signals if the maximum value exceeds a threshold level specified by the user,

wherein said three or more channels of audio signals constitute a set of surround signals in an ordinary surround system and are grouped together into one or more groups during said group arrangement process.

wherein, when the maximum signal level is below the threshold level, the adjustment process is performed to maintain the common amplification gain, when the maximum signal level

exceeds the threshold level, the adjustment process is performed to attenuate the level of the input audio signals, and

wherein the common amplification gain is determined such that the excess of the maximum value is suppressed in accordance with a ratio specified by the user.

Claim 20 (previously presented): The level adjustment method according to claim 11, wherein the group arrangement process is applied to audio signals of a surround system having a least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel and the LFE channel, and the group arrangement process arranges the channels into a first group including the left channel, the right channel, the left surround channel, the right surround channel and the center channel, and a second group including the LFE channel.

Claim 21 (previously presented): The level adjustment method according to claim 11, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel and an LFE channel, and the group arrangement process arranges the channels into a first group including the left channel, the right channel and the center channel, a second group including the left surround channel and the right surround channel, and a third group including the LFE channel.

Claim 22 (previously presented): The level adjustment method according to claim 11, wherein the group arrangement process is applied to audio signals of a surround system having at least six channels including a left channel, a right channel, a left surround channel, a right surround channel, a center channel and an LFE channel, and the group arrangement process arranges the channels into a first group including the left channel and the right channel, a second group including the left surround channel and the right surround channel, a third group including the LFE channel, and a fourth group including the center channel.